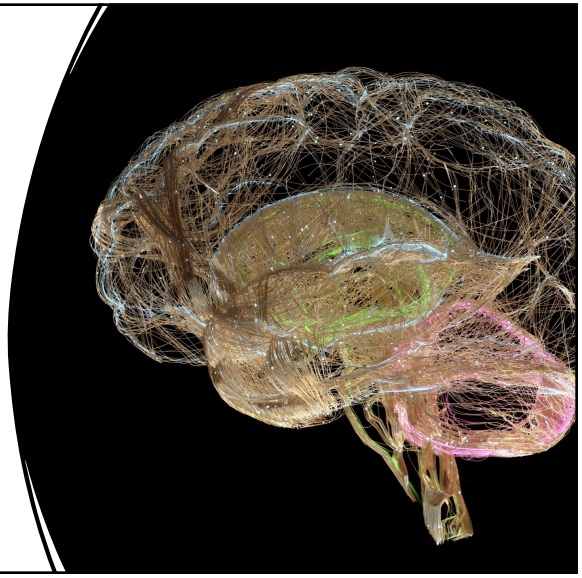
Alzheimer's Disease



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Alzheimer's Disease Statistics

- **Most common type of Dementia**
- **In 2020, as many as 5.8 million Americans were living with Alzheimer's disease**
  - **The 6th leading cause of death among US adults.**
  - **The 5th leading cause of death among adults aged 65 years or older.**
- **The number of people living with the disease doubles every 5 years beyond age 65.**
- This number is projected to nearly triple to 14 million people by 2060.

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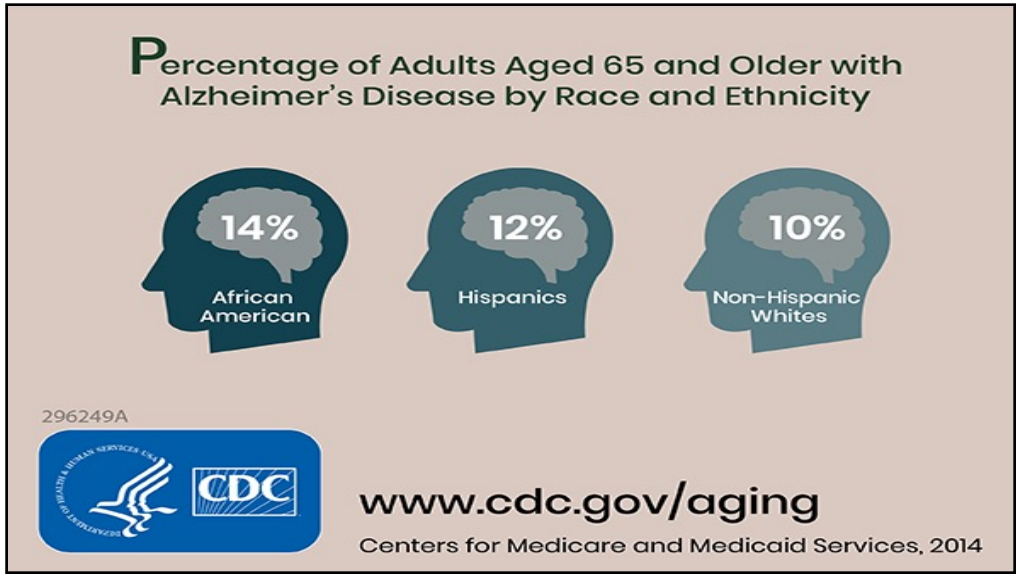

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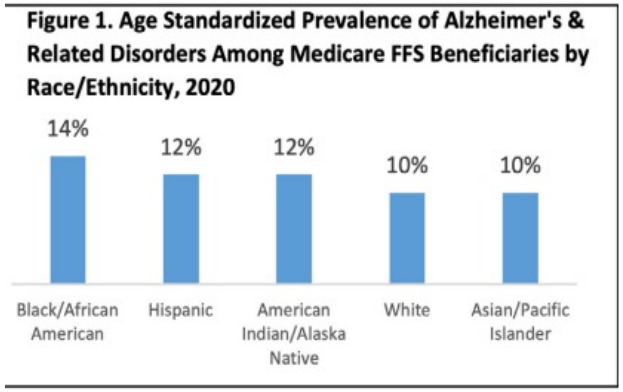
Centers for Medicare and Medicaid

- Data from the Centers for Medicare & Medicaid Services' (CMS's) Chronic Conditions Data Warehouse indicates that about
  - **11.1% of all Medicare fee-for-service (FFS) beneficiaries had claims with a diagnosis of Alzheimer's disease or a related dementia, and 3.9% of the beneficiaries had Alzheimer's disease in 2019.**
- The age standardized prevalence rate of Alzheimer's disease or a related dementia among **Black/African American beneficiaries (14%)** was higher than other racial/ethnic groups, and the lowest rates were observed in the **Asian/Pacific Islander and White beneficiaries (10%)** as shown in Figure 1.
- The prevalence was higher among older beneficiaries as shown in Figure 2.
  - **More than one third of beneficiaries aged 85 and older had claims with a diagnosis of Alzheimer's disease or a related dementia while only 4% of beneficiaries aged 65**

4

Based on The Mapping Medicare Disparities (MMD) Tool developed by CMS Office of Minority Health for Medicare Fee For Service



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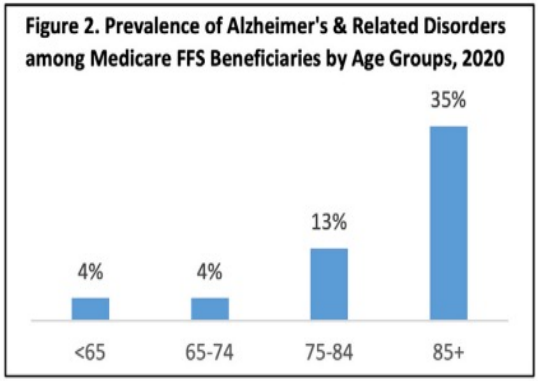

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Ethnic Variables

- Disparities found in:
  - Diagnosis
  - Management of symptoms such as depression, anxiety, and behavioral disturbances
  - Access to or utilization of support services

7

Dementia Diagnostic Criteria

What is Alzheimer's Disease?

8

Dementia

DSM-5: Neurocognitive Disorder

- Dementia is the umbrella term for a number of neurological conditions, of which the major symptom is the decline in brain function due to physical changes in the brain. It is distinct from mental illness.
- New diagnostic criteria for dementia were developed and released in 2013.
- Dementia is categorized as a Neurocognitive Disorder (NCD) in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). The NCD category is then further subdivided into Minor NCD and Major NCD. The term "cognitive" refers to thinking and related processes, and the term "neurocognitive" has been applied to these disorders to emphasize that brain disease and disrupted brain function lead to symptoms of NCD.
- The NCD category encompasses the group of disorders that the primary clinical deficit is in cognitive function, which is ACQUIRED rather than developmental. Impairment may occur in attention, planning, inhibition, learning, memory, language, visual perception, spatial skills, social skills or other cognitive functions.

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Minor Neurocognitive Disorder

- Medically referred to as *Prodromal Disease or Mild Cognitive Disorder (MCI)* and is defined by the following criteria:
- There is evidence of modest cognitive decline from a previous level of performance in one or more of the domains, based on the concerns of the individual, a knowledgeable informant or the clinician; and a decline in neurocognitive performance on formal testing or equivalent clinical evaluation.
- The cognitive deficits are insufficient to interfere with independence (for example instrumental activities of daily living such as complex tasks of paying bills or managing medications, using the telephone), **but** greater effort, compensatory strategies, or accommodation may be required to maintain this independence (writing notes, reminders, alarms).
- The cognitive deficits do not occur exclusively in the context of a delirium.
- The cognitive deficits are not primarily attributable to another mental disorder (for example major depressive disorder and schizophrenia).

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Major Neurocognitive Disorder

- There is evidence of substantial cognitive decline from a previous level of performance in one or more of the domains, based on the concerns of the individual, a knowledgeable informant, or the clinician; and a decline in neurocognitive performance on formal testing or equivalent clinical evaluation.
- The cognitive deficits ARE sufficient to interfere with independence (i.e. requiring minimal assistance with instrumental activities of daily living).
- The cognitive deficits do not occur exclusively in the context of a delirium.
- The cognitive deficits are not primarily attributable to another mental disorder (for example major depressive disorder and schizophrenia).

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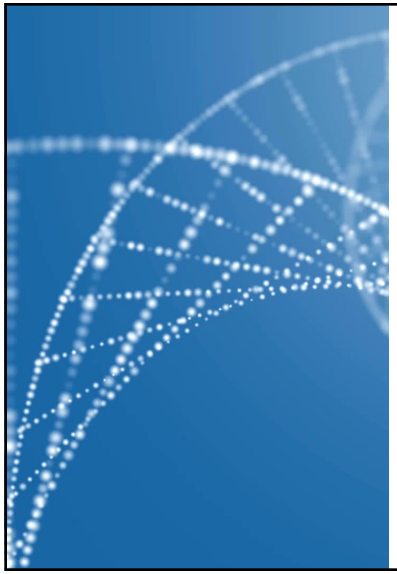

Cognitive Domains

The DSM-5 details six cognitive domains which may be affected in both Minor and Major NCD.

1. Complex Attention
2. Executive Ability
3. Learning and Memory
4. Language
5. Perceptual Motor/ Visual Perception
6. Social Cognition

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Complex Attention

- **Sustained Attention**: the ability to focus on an activity or stimulus over a long period of time. It is what makes it possible to concentrate on an activity for as long as it takes to finish, even if there are other distracting stimuli present.
- **Divided attention:** the ability to pay attention to two tasks at once such as cooking a meal while talking to a friend or driving a car and talking to a passenger at the same time – neither activity is stopped in order to carry out the other activity.
- **Selective attention:** the processes that allow an individual to select and focus on one particular input for further processing while simultaneously suppressing irrelevant or distracting information.
- **Information processing speed:** the time that lapses from when you receive information until you understand it and start to respond

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Executive Ability

Three Areas of Executive Functioning

1. Working Memory: Ability to keep information in mind and use it in some way.
2. Cognitive Flexibility: Ability to think about something in more than one way
3. Inhibitory Control: Ability to ignore distractions and resist temptation.

- Executive function skills allow people to think before they act and consider consequences.
- Processing speed impacts how well people can use executive function skills.

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Learning and Memory

Learning is the acquisition of skill or knowledge, while **memory** is the expression of what you've acquired.

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Language

Decline in formal language:

Vocabulary Comprehension Speech production

- **Expressive language:** ability to call up the word they desire in a given moment. When one's expressive language decreases, words that are available may be used rather than the most obvious word. For example; an elevator become "the up down up down up down."
- **Receptive language:** it describes when we hear a word knowing what concept it connects to. For example; the word fork does not connect in the brain to the object fork.

These two types of language use do not change equally. Someone may have large changes in their expressive language and no changes in their receptive language or vice versa.

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Perceptual Motor/ Visual Perception

- Perceptual Motor: **understanding what one sees**—how the brain and the eye speak to each other
- Visual-spatial Perception is the **ability to tell where objects are in space**. That includes your own body parts. It also involves being able to tell how far objects are from you and from each other. People use visual-spatial processing skills for many tasks, from tying shoes to reading a map, walking in a room.

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Social Cognition

- With a shift in social cognition there is less of a filter between thoughts, feelings, and actions.
- All humans have thoughts and feelings that are not socially acceptable. These are often fleeting and most of us have learned not to verbalize or act on them.
- As social cognition shifts, and this filter becomes more permeable, one acts on these flashes of emotion.

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Neurocognitive Disorder

NCD/Dementia is more than just memory loss.

NCD/Dementia is complex, 6 domains of cognition involved.

NCD/ Dementia is an umbrella term; once criteria are met, further evaluation is needed to determine type of dementia.

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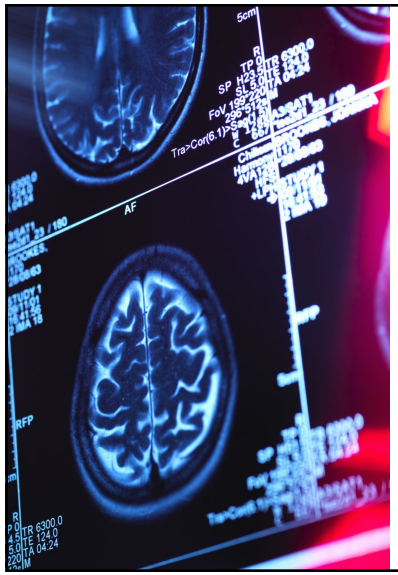

Getting a Diagnosis

- Once symptoms are present, a referral to a specialist is made.
- Diagnosis is not a one step process.
- Exams Must Include:
  - Medical Exam (physical)
  - Clinical Exam (the history, examination, and the explanation)
  - Neuropsychological Exam
  - Brain Scans
  - Lab Work

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WHY:

Extensive exams are used to RULE OUT any other disorders or disease that may cause changes in cognition.

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Reversible Dementia

- Drug Interactions
- Emotional Disorders
- Metabolic/ Endocrine Disorders (thyroid)
- Eyes/Ears
- Nutritional Deficits/Electrolyte Imbalance
- Tumors
- Infection (UTI, Pneumonia)
- Arteriosclerosis (Congestive Heart Failure)

* Anesthesia and/or surgery, hydrocephalus, environment changes, lifestyle changes such as moving, different caregivers, etc

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Irreversible Dementia

Alzheimer's Disease	Parkinson's Disease	Vascular Dementia	Frontotemporal Lobe Dementia's
Lewy Body Dementia	Limbic Predominant TDP-43 Encephalopathy	Huntington's Disease	Creutzfeldt-Jakob Disease (CJD)

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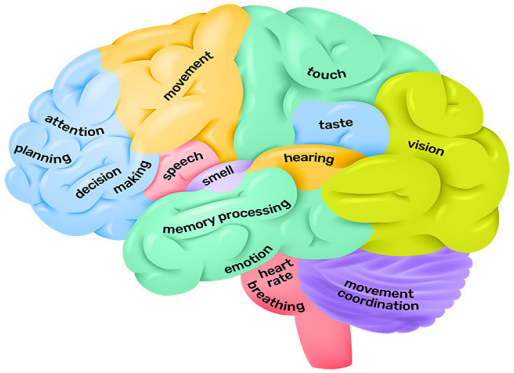
Inside the Brain

What Happens in Alzheimer's Disease?



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Human Brain

Key biological processes in the brain

- Most neurons have three basic parts: a cell body, multiple dendrites, and an axon.
- The **cell body** contains the nucleus, which houses the genetic blueprint that directs and regulates the cell's activities.
- **Dendrites** are branch-like structures that extend from the cell body and collect information from other neurons.
- The **axon** is a cable-like structure at the end of the cell body opposite the dendrites and transmits messages to other neurons.

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The function and survival of neurons depend on several key biological processes:

Metabolism

Metabolism—the breaking down of chemicals and nutrients within a cell—is critical to healthy cell function and survival.

To perform this function, cells require energy in the form of oxygen and glucose, which are supplied by blood circulating through the brain.

The brain has one of the richest blood supplies of any organ and consumes up to 20 percent of the energy used by the human body—more than any other organ.

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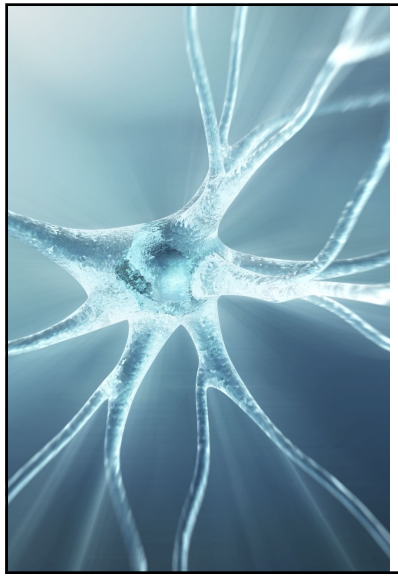

The function and survival of neurons depend on several key biological processes:

Communication

Neurons are constantly in touch with neighboring brain cells.

When a neuron receives signals from other neurons, it generates an electrical charge that travels down the length of its axon and releases neurotransmitter chemicals across a tiny gap, called a synapse.

Like a key fitting into a lock, each neurotransmitter molecule then binds to specific receptor sites on a dendrite of a nearby neuron.

This process triggers chemical or electrical signals that either stimulate or inhibit activity in the neuron receiving the signal.

Communication often occurs across networks of brain cells.

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The function and survival of neurons depend on several key biological processes:

Repair, remodeling, and regeneration

Neurons have evolved to live a long time.

As a result, neurons must constantly maintain and repair themselves. Neurons also continuously adjust, or "remodel," their synaptic connections depending on how much stimulation they receive from other neurons.

For example, they may strengthen or weaken synaptic connections, or even break down connections with one group of neurons and build new connections with a different group.

Adult brains may even generate new neurons—a process called neurogenesis.

Remodeling of synaptic connections and neurogenesis are important for learning, memory, and possibly brain repair.

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Changes to Neurons in Alzheimer's Disease

Amyloid Plaques

Amyloid plaques consist of dense, mostly insoluble clumps in the spaces between the nerve cells in the brain tissue. The plaques are made up of beta-amyloid, which is a protein peptide or fragment that appears to have toxic effects on the function of the surrounding brain cells.

(Between nerve cells)

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Changes to Neurons in Alzheimer's Disease

Neurofibrillary Tangles

They involve the twisting of tau protein threads of the nerve cells in the brain tissue.

- The role of tau is to stabilize microtubules and the role of microtubules is to promote communication and transport nutrients within the neurons.
- When tau does not bind properly, they twist and tangle, microtubules weaken and collapse. As a result of this, the internal transport network of the neurons collapses and inhibits the ability of the neurons to work together.
- **Communication is disrupted, nutrition is depleted, oxygen is deprived, and atrophy results.**

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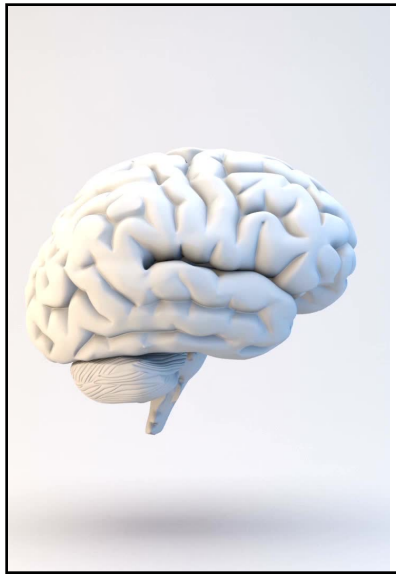

Cerebrum and Cerebral Cortex

- When you picture the iconic shape of the human brain, the majority of what's visible is the cerebrum (front of brain).
- It makes up around 85% of the brain and consists primarily of grey matter (cerebral cortex), divided into two hemispheres.
- The cerebrum is where most of the important brain functions happen, such as thinking, planning, reasoning, language processing, and interpreting and processing inputs from our senses, such as vision, touch, hearing, taste and smell.

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Cerebral Cortex

The outer layer of the cerebrum is called the cerebral cortex, and each hemisphere is traditionally divided into four lobes:

Frontal
Parietal
Occipital
Temporal

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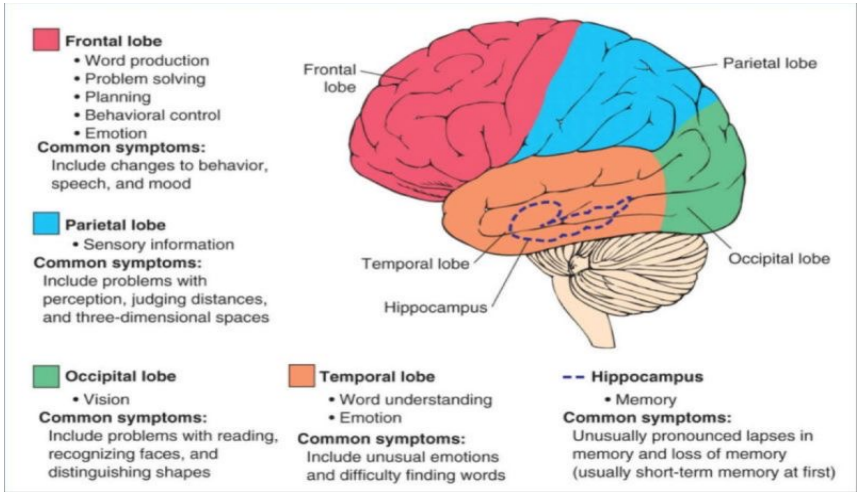

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Frontal Lobes

Home to everything that is intrinsically human: Executive Functioning
Associated with the word "**Action**", both mental and physical

Problem solving
Regulating emotions
Judgement
Motivation
Learning
Ability to develop plans and strategies
Language/ Speech (production of)
Abstract thought
Decision Making

Reward
Impulse control
Social Behavior
Personality
Memory
Attention
Skeletal muscle movement
Voluntary muscle movement
Facial muscle movement

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Temporal Lobes

Assists with the perception and interpretation of sound (understanding language).

Plays a role in the recognition of objects, facial recognition, and visual memory.

Play an important role in processing affect/emotions

Left Temporal Lobe code and store verbal information for later recall.

The left temporal lobe is associated with understanding language, learning, memorizing, forming speech and remembering verbal information.

Right Temporal Lobe stores spatial memories. It is associated with learning and memorizing non-verbal information (e.g. drawings and music), recognizing information, and determining facial expressions.

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Parietal Lobe

- Primarily responsible for special information including cognitive skills for planning routes, organizing complex visual materials.
- The parietal lobe is vital for sensory perception and integration, including the management of taste, hearing, sight, touch, and smell. It is home to the brain's primary somatic sensory cortex: a region where the brain interprets input from other areas of the body.

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Occipital Lobe

- Located at the back of the brain
- The occipital lobe is the visual processing area of the brain. It is associated with visuospatial processing, distance and depth perception, color determination, object and face recognition, and memory formation.

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Limbic Region

Oldest region of the brain : it is the part of the brain involved in our behavioral and emotional responses, especially when it comes to behaviors we need for survival.

The limbic system is a part of the brain that deals with three major functions:

- Emotions.
- Memories.
- Arousal.

Two important structures in the limbic system are the hippocampus and amygdala

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Limbic System: 2 key areas

Hippocampus

- Memory center of the brain
- Episodic memories are formed and then filed away into long term memory
- Declarative memories are those related to facts and events.
- Plays a role in spatial navigation: Spatial relationship memories involved in choosing pathways or routes.
- Associated with learning and emotions

Amygdala

- The main function of the amygdala is in emotional responses, including feelings of happiness, fear, anger, stress, and anxiety.

  "fight, flight, or freeze" response
- This area is also key for the formation of new memories. The amygdala interacts with the hippocampus by attaching emotional content to memories.
- It has a role in how memorable memories can be – memories that have strong emotional components tend to stick, rather than those with little emotional content.

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Cerebellum

- "little brain", located at the back of the head below the temporal and occipital lobes, above the brainstem.
- Responsible for motor coordination
- The cerebellum coordinates voluntary movements such as posture, balance, coordination, and speech, resulting in smooth and balanced muscular activity. It is also important for learning motor behaviors.
- Coordination of voluntary movement.
- Balance.
- Posture.
- Motor-learning.
- Sequence learning
- Reflex memory.
- Mental function.
- Emotional processing.

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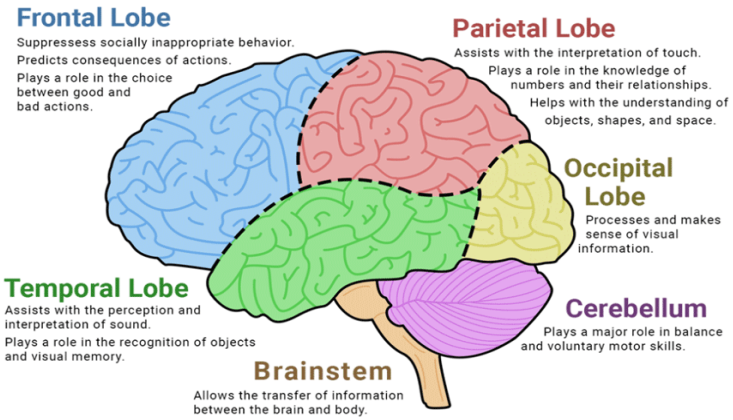
Human Brain



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7 Stage Clinical Course

Stage 1: Pre-Clinical

No obvious memory loss or cognitive decline

The characteristic changes of the brain (plaques and tangles) have already begun to form in the hippocampus region of the brain.

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7 Stage Clinical Course

Stage 2

- Minor memory problems such as remembering recent conversations, appointments, or distant places.
- Difficulty judging or managing the steps in complex tasks.
- Subjective problems finding the right word, misplacing items
  - Often attributed to benign forgetfulness or “stress”.

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Stage 3

- Memory loss is clear and the individual may have difficulty performing tasks that were once routine.
- May get lost going to familiar places
- Difficulty remembering new names
- Difficulty with work, social tasks, or managing finances

Individuals may experience negative emotions such as anxiety, depression, irritability due to awareness of such problems.

Individuals usually get diagnosed during this stage due to impact on ability to maintain IADL (Instrumental/Independent Activities of Daily Living

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7 Stage Clinical Course

Stage 4

- Plaques and Tangles invade the brain, memories of recent past fade and the memory processing center is compromised.
- Decreased judgement
- Inappropriate social behavior
- Emotional instability
- Loss of ability to recognize objects, people, places.
- Flattening affect, withdrawn, denial

45

7 Stage Clinical Course

Stage 5

- Disease has progressed to the back of the brain:
- Problems noted with recent and past memory and with recalling special events.
- Individual requires assistance with all ADL due to difficulty completing complex tasks.
- Individual is disoriented to time and place.

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Stage 5 cont'd

- During stage 5, AD patients loose perceptual vision and the ability to focus on or track a moving object.
- Spatial disorientation, increased risk for falls.
- Personality and emotional changes are pronounced as evidenced by:
  - Anxiety
  - Depression
  - Delusions
  - Hallucinations
  - Agitation

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7 Stage Clinical Course

Stage 6

- Language and communication deficits become severe.
- Individual may be incoherent at times
- Damage to frontal lobe is severe
- Damage to motor cortex results in muscle weakness, poor balance, rigidity.
- Difficulty organizing body movement, incontinence and swallowing difficulties are common.
- Because of their cognitive deficits, persons at this stage can no longer channel their energies into productive activities. Consequently, persons may begin to fidget, to pace, to move objects around, or to manifest other forms of purposeless or inappropriate activities. Fear of being alone, disoriented
- Because of their fear, frustration and shame regarding their circumstances, these persons frequently develop verbal outbursts and also threatening, even violent behavior.

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7 Stage Clinical Course

Stage 7

- Individual dependent for all ADL care
- Involuntary systems such as heart, lungs, diaphragm, digestive system are affected. Essentially, body begins to shut down.

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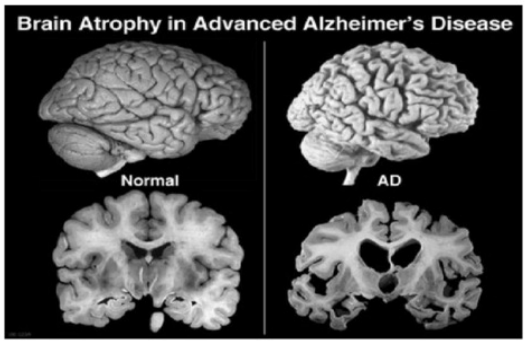
Healthy Brain vs Alzheimer's Brain



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Treatment Options

Managing Symptoms with Medication

- Cholinesterase inhibitors. These medications — including donepezil (Aricept), rivastigmine (Exelon) and galantamine (Razadyne) — work by boosting levels of a chemical messenger involved in memory and judgment.
- Memantine. Memantine (Namenda) works by regulating the activity of glutamate, another chemical messenger involved in brain functions, such as learning and memory. In some cases, memantine is prescribed with a cholinesterase inhibitor.
- Other medications. Your doctor might prescribe medications to treat other symptoms or conditions, such as depression, sleep disturbances, hallucinations, parkinsonism or agitation.

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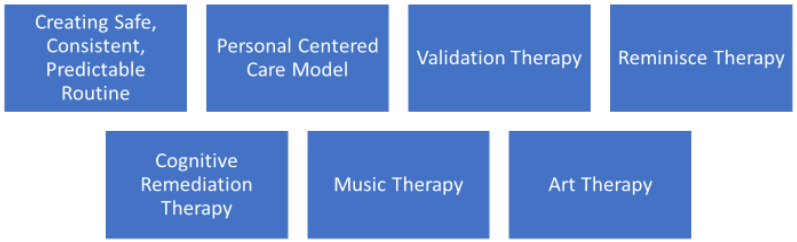
Nonpharmacological Treatment



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Nonpharmacological Approaches

Positive Purposeful Interaction

- **Focus on the PERSON, not the task! SLOW DOWN!**
- **Support strengths and abilities**
- **Ask questions, share information (provide verbal cues, emotional connection, and validation)**

Behavior is Communication

- **All behavior has meaning, identify the unmet need**
- **Identify and validate feelings (anxiety, depression, as well as joy, excitement….)**
- **Encourage active participation in daily activities for increased self esteem and purpose**
- **Identify and modify stressors: Emotional, Medical, Environmental**

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End of Life Care

Palliative Care:

Palliative care is specialized medical care for people living with a serious illness. This type of care is focused on providing relief from the symptoms and stress of the illness. The goal is to improve quality of life for both the patient and the family.

www.getpalliativecare.org

Hospice Care:

Medical care for people with an anticipated life expectancy of 6 months or less, when cure isn't an option, and the focus shifts to symptom management and quality of life.

www.hospicefoundation.org

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Care Planning and Documentation

WHO:
WHO WAS PRESENT

WHAT:
DETAIL WHAT OCCURRED, POSITIVE OR PROBLEMATIC

WHEN:
DETAIL TIMING

WHY:
IDENTIFY TRIGGERS OR UNMET NEEDS

HOW:
IDENTIFY WHAT CAN BE REALISTICALLY BE DONE

GOAL IS PERSON CENTERED APPROACH FOCUSED ON ABILITY.

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Summary

- Alzheimer's Disease is a neurodegenerative disease.
- Alzheimer's Disease is a terminal illness.
- Monitor for emotional and behavioral symptoms.
- Typical course is 7-20 years.

Resources:
Alzheimer's Association
National Institute on Aging
Local Neuropsychological Diagnostic Centers

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Assessment tools:

1.Function Assessment Staging Test (FAST); Dr. Barry Reisberg, MD
2. Global Deterioration Scale (GDS); Dr. Barry Reisberg, MD
3. Brief Cognitive Assessment Tool (BCAT)
4. Mini-Cog Screening
4. Mini Mental Status Exam
5. Depression and Anxiety Screening should be conducted

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Educational Resources

- **Alzheimer's Association**
  - **www.alz.org**
- **Illinois Cognitive Resources Network**
  - **www.ilbrainhealth.org**
- **Cognitive Neurology and Alzheimer's Disease Center, Northwestern**
  - **www.brain.northwestern.edu**
- **Rush Memory Clinic**
  - **www.rush.edu (312) 942-3333**
- **University of Chicago Memory Clinic**
  - **www.thememorycenter.uchicago.edu**
- **National Institute of Health/National Institute on Aging**
  - **www.nia.nih.gov**
- **Illinois Department on Aging**
  - **https://ilaging.illinois.gov/**

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